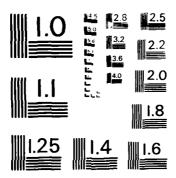
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NORDSEE RADAR BACKSCATTER MEASUREMENTS DATA REPORT

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THE UNIVERSITY OF KANSAS CENTER FOR RESEARCH, INC.

2291 Irving Hill Drive—Campus West Lawrence, Kansas 66045

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NORDSEE RADAR BACKSCATTER MEASUREMENTS DATA REPORT

S. Gogineni A.H. Chaudhry R.K. Moore

Remote Sensing Laboratory Center for Research, Inc. The University of Kansas Lawrence, Kansas 66045-2969

RSL Technical Report < RSL TR 419-2

March 1984

Supported by:

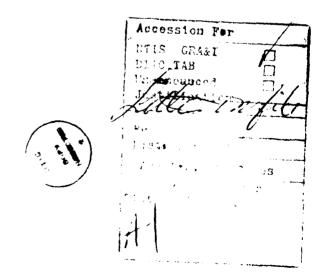
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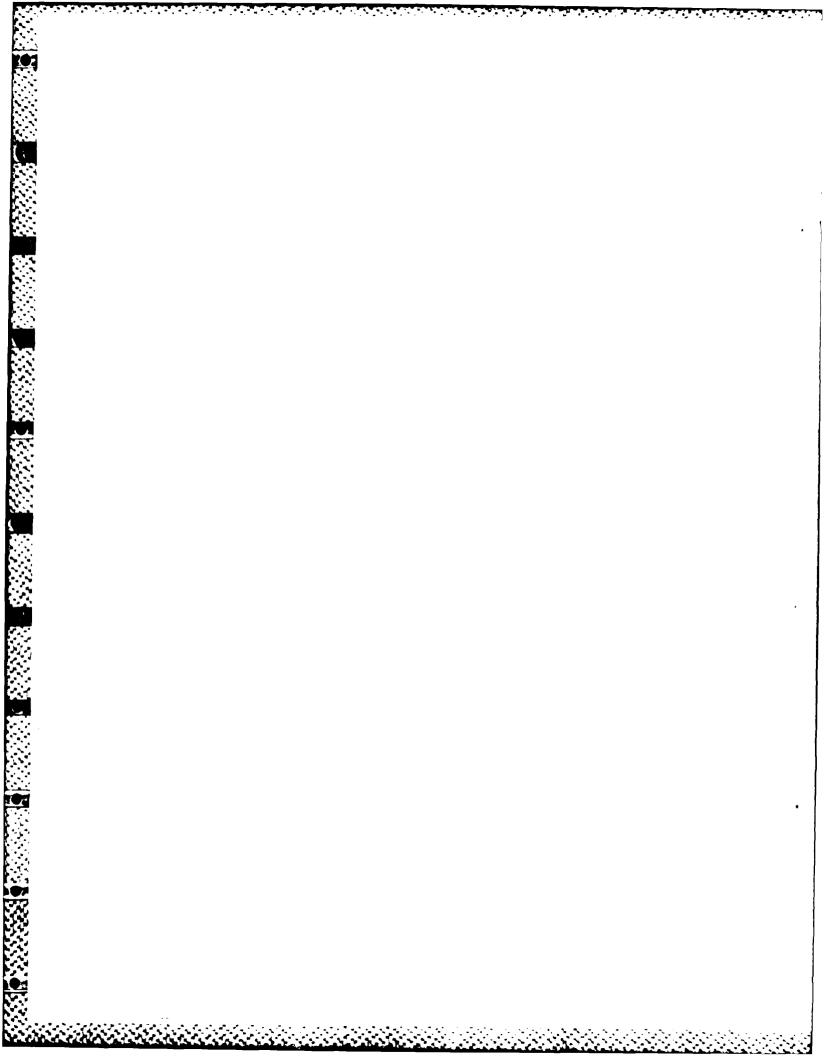
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NORDSEE RADAR BACKSCATTER MEASUREMENTS DATA REPORT

S. Gogineni, H. Chaudhry and R.K. Moore Remote Sensing Laboratory University of Kansas Center for Research, Inc. Lawrence, Kansas 66045-2969, U.S.A.

ABSTRACT

This report summarizes the radar backscatter measurements of the ocean made by the University of Kansas from the Nordsee tower during the period from January 20 through February 3, 1984.

1.0 INTRODUCTION

Radar backscatter measurements of the ocean were made by University of Kansas (KU) investigators from the Nordsee tower to determine scattering coefficient as a function of wind speed, incidence angle and look direction at C-, X- and Ku-bands and to determine the modulation of Bragg-resonant ripples by long waves.

A modified version of the KU helicopter-borne scatterometer (HELOSCAT) was used to acquire the data. The radar backscatter data were collected at selected frequencies between 4 and 17 GHz, and incidence angles between 18° and 70° with VV- and HH-polarizations.

The purpose of this report is to summarize the data collected during the experiment. A brief description of the system used for these measurements is given in Section 2.0. Section 3.0 and Appendix I summarize the data.

Appendix II is a reproduction of the data log.

2.0 SYSTEM DESCRIPTION

Type

A modified version of HELOSCAT III was used to acquire the radar backscatter from the ocean during this experiment. The system was operated in the laboratories located on the lower deck of the Nordsee tower. The antenna mount was installed on the southeast corner of the lower deck. A microcomputer was used to sample different instruments and record the data on a digital cassette tape.

The relative calibration of the system was performed by measuring the signal from the delay line switched in place of the antenna. The absolute calibration-was performed by measuring the power received from targets of known radar cross-section (a metal sphere of 20 cm diameter and a Luneberg lens were used during this experiment). The important specifications of the system used in this experiment are given in Table 1.

TABLE 1 SYSTEM SPECIFICATIONS

FM-CW

.5,60	•••
Frequency Range	4-17 GHz
FM Sweep	750 MHz
Transmitted Power	5-16 dBm
Intermediate Frequency	50 kHz
IF Bandwidth	13.5 kHz
Antenna: Polarization Size Two-Way Effective Beamwidths	Log-Periodic Reflector VV, HH 61 cm 5.2°, 2.8° and 2.0° at 5.3, 10, and 15 GHz
Incidence Angles	18° to 70° from vertical
Calibration: Internal External	Delay line Metal sphere and Luneberg lens
Height	24 meters

3.0 EXPERIMENT SUMMARY

Measurements of the radar backscatter from the ocean were made as part of the ESA C-band wind scatterometer campaign. Facilities and support were provided by German participants.

The primary emphasis in the data collection was to acquire long data runs at a fixed azimuth and incidence angle at 5.3, 10 and 15 GHz with VV-polarization. In addition, during aircraft overflights measurements were made at a fixed azimuth angle and the same incidence angles as that used by the equipment in the aircraft at 5.3 GHz with VV-polarization. The measurements were extended to other frequencies and HH-polarization as much as possible. Internal calibration of the system was performed before and after each data run.

A summary of each data run on a day-to-day basis is given in the tables in Appendix I. Also to be found in Appendix I are the total number of hours of data collected for up-, down-, and crosswind and the names of tapes which contain these data. The wind speed and directions given in the table are averages over an hour.

4.0 CONCLUSIONS

The radar system performed without any trouble during the experiment. A total of 140 hours of data has been collected out of which 65 hours are for upwind, 17 hours are for downwind, and 53 hours are for crosswind, the remaining 5 hours being for internal and external calibration. We believe the data collected will be useful in determining the scattering coefficient as a function of wind speed, incidence angle and look direction, and the modulation transfer function.

APPENDIX I

Total number of hours of data = 140

Wind Direction	No. of hours	Tapes
Upwind	65	4B, 5A, 5B, 6A, 8B, 9A, 10A, 10B, 11A, 11B, 12A, 12B, 13A, 13B, 14A, 14B, 15A, 16B, 17A, 17B, 18A, 18B, 19A, 20B, 21A, 21B, 22A, 22B, 24A, 24B, 25A, 25B, 26A, 26B, 27A
Downwind	17 hrs, 20 min.	1A, 1B, 2A, 2B, 3A, 3B, 4A, 7A, 7B, 8A
Crosswind	53 hrs, 15 min.	6A, 6B, 7A, 8A, 8B, 9A, 9B, 15A, 15B, 16A, 16B, 19A, 19B, 20A, 20B, 21A, 22B, 23A, 23B, 24A

APPENDIX II
Reproduction of Data Log

IC: Intérnal calibration C: Cross wind, D: Down wind, U: Up wind

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DATE: Jan 22, 1864

IC: Intérnal calibration C: Cross wind, D: Down wind, U: Up wind

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DATE: Jun 23 1984

IC: Intérnal calibration C: Cross wind, D: Down wind, U: Up wind

DATE: Jan. 23, 1954

IC: Intérnal calibration C: Cross Wind, D: Down wind, U: Up wind

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DATE: Jan 24, 1984.

IC: Intérnal calibration . C: Cross wind, D: Down wind, U: Up wind

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IC: Intérnal calibration .c: Cross Wind, D: Down wind, U: Up wind

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DATE: JOH 25, 1964

IC: Internal calibration C: Cross wind, D: Down wind, U: Up wind

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DATE: Jan. 25, 1754

IC: Intérnal calibration C: Cross wind, D: Down wind, U: Up wind

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DATE: Jan 25, 1984

IC: Internal calibration .C: Cross wind, D: Down wind, U: Up wind

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DATE: Jan 26, 1784

IC: Intérnal calibration C: Cross wind, D: Down wind, U: 1.p wind

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IC: Internal calibration C: Cross wind, D: Down wind, U: Up wind

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260301	MA	5.3	10					•				
260303	1	\ \	>	55°	· 3	90:91	16.36	\ <u>`</u>	3.6	30		Lynfie white
260304		6,	ŢĊ.	;- 	3			·	*.		· · · · ·	
269305	.	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	3	, 22°	၁	16:40	01:11	1.5	3.6	75 de 1	`	Synfan
26030 6	* ,		Įc				i				د. نه	.:

IC: Internal calibration
C: Cross wind, D: Down wind, U: Up wind

	RUN NO.	TAPE	FREQ	POL	ANGLE OF INC.	LOOK DIREC-	START	TIME	TEMPERATURE C	URE	SPEED	WIND DIRECT-		
	·				(9• p)	TION	X	H . H	An	untu	(Knots	ION (Seg)		
1.	. For 03 £	118	15	JC							٠ ٨٠٠			
	260402	•	•	>	55,	2	9/:2/	44:41	<u> </u>	3.7	36		Syn from home	35
	260403	*	` `	ΣC										
	401.090	*	4.5-3.4	Ic								:	:	
	260405	11B	*	3	55°	2	17:56	24:81	. 7	2.2	28		`	`
	904092	*	ì	sc					-		,			
 *	100,097		9.0-14.0	Ic									•	
	8 04 040		*	3	55,	2	34.31	h 7: 6/	٠. ۲	3.7	28		*	:
<u>`</u>	260409	`	ì	52			•							
	105036	٤	5.3	Ic	r									
	760503	ì	*	}	9	<u>ت</u>	10:07	he:or	5.	3.9	20		;	
	260503	`	ì	Ic					•			•	:	`
_,,	260505	12.4	0,	Ic	,					•			,	
	905097	*	` `	3	65.	2	\$: 67	3/:/6	4.	رن م	n.		`	١
	260507	į	.,	25			•							
	80509		5	IC	•	1	i.s.	•••••		•	· 经基础的			
	1605091		,	>	65	2	21:19	21:50	7.0-	39	74 36			;
· Files	Potott	,		7.0		. .	1 + 2 1 1 1 1 1 1 1 1 1 1			Section 1	2	; ;		
			-	•	-	-	•			-	•		_	_

IC: Internal calibration . C: Cross wind, D: Down wind, U: Up wind

12.4 45-77 16 665) TION H : H H : H A. AZALL (Knote (Zd.7)) 12.4 45-77 16 5° U 123:17 -0.6 3 8 34 12.8 90-80 66 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1	RUN NO.	TAPE	FREQ	POL	ANGLE OF INC.	LOOK DIREC-	START	TIME	TEMPERATURE C		SPEED	DIRECT-	
45-77 1C 1	·				(geb)	TION		••	Air	uah	(Knots	<u>0</u>	
12.8 90-80 fc	270703	12.4	45-27	3C VV	659	٥	91:52	13:17	3.0-		34		12 L
12.8 90-8: ic. " " " " " " " " " " " " " " " " " " "	70705	ì	ì	7,0									Run num
, , , , , , , , , , , , , , , , , , ,	90€0€	128	0.81-06	ić.	;								26 00
	70707	*		>	. 5 9)		06:30	0.	3.6	37	! .	whitecon
	30406	`	`	1,0	٠.				_				
			: 4					-		:	5 5		
	•												
	. ,							•				- .	
		`									•		
	•						:	•					
					. 4		-		. <u></u>				
	4 4 7				12 juga				•	ر الله الله الله الله الله		<u>.</u>	
では、「一般のないとのです。」では、「一般のでは、「一般のです」というです。 のでは、「一般のです。」では、「一般のです」というできます。「「一般のです」というできます。「「一般のです」というできます。		7			pe	÷			•		•		
					* *** * 5	<u>.</u> 22		,3 . 16.	;				

DATE: Jan 27, 1984

IC: Intérnal calibration C: Cross wind, D: Down wind, U: 1jp wind

12.6 4.5-37 2.6	RUN NO. TAPE	TAPE	FREQ	Tod	ANGLE OF INC.	LOOK DIREC-	START	TIME	TEMPERATURE C	TURE	SPEED	WIND DIRECT-	
12.8 4,5-37 3C 1.					(9. 8)	TION	-	••	Ar	unta	(Knots		
7.	160001		4.5-3.7	25	•								15 m # 5 km
" " 120 " " 120 " " 120 " " 140 " " 150 " " 150 " " 160 " " " 160 " " " 160 " " " 160 " " " 160 " " " 160 " " " 160 " " " 160 " " " 160 " " " 160 " " " 160 " " " 160 " " " " 160 " " " " 160 " " " " 160 " " " " 160 " " " " 160 " " " " 160 " " " " 160 " " " " 160 " " " " 160 " " " " 160 " " " " 160 " " " " " 160 " " " " " 160 " " " " " 160 " " " " " " 160 " " " " " " 160 " " " " " " " 160 " " " " " " " " " " " " " " " " " " "	130801	` `	*	>	, 53	2	1361	80.hl	/3	70	2.2		
940-180 3C 1, VV 65 U 14.15 15:17 1.3 4.0 22 5.3 MATE 1, 16 14 140 22 1, 16 14 16 53 1.6 4.1 34 1, 16 14 16:53 1.6 4.1 34	1.3826	` .	;	35									
13.7 " 12.6 "	503041	÷	0.81-06	20					•				
" " " " " " " " " " " " " " " " " " "	208061	131	``	>	65,	כ	51.41	11:51	1.3	4.0	77		
" " " " " " " " " " " " " " " " " " "	108027	` .	``	75									
" " 10 IC " " " 140 1612 1.4 40 21 " " " " " 10 IC " " " " " " 10 IC " " " " " " 10 IC " " " " " " " " " " " " " " " " " "	106061	` `	5.3	TE POR							-		
" " 10 IC " " " 14.1 655" U 16.12 16.39 1.5 40 22 " " " " " " " " " " " " " " " " " "	370405	``	``	1111	, 49	2		2/ 9/	<u>,</u>	40	2.4		Chemyert felt.
" " " (40 12) (6.39 1.5 40 12) (7.5	504061	` .	` `	77				•					مر مر م
" " 11 65° U 16.12 16:39 1.5 40 " " 26 138 4.15 16 " " ## 65° U 16.41 16:53 1.6 4.1	906061	` .	10	ĬC.				•				• -	
13.8	£06.7£(ì	`	117	6.5,	2		68:31	. 5.	0 5	12		
138 125 16 16 16 16 16 16 16 16 16 16 16 16 16	300,000	ì	*	25									
1.4 65° U 1641 16·53 1.6 4.1	5060£	13.8	212	10									
,,	01606	*	*	N/N	,59	2		€5.91	9:1	- 5	34		•
	#160£	`	ì	27		. ·							

DATE: JAn. 27, 1984

IC: Interpal calibration C: Cross wind, D: Down wind, U: up wind

	<u> </u>																
i	ا ۴۰۰هم																-
WIND DIRECT- ION (A-y)	_ 							-			. •	٠.					
WJAC SPEED (Knots)	32			44			49	-	18				t f) H
3	1.4			2,			7						7	-		4.0	
TEMPERATURE C	1.7		ć	4	•		ケイ		7.3	\ • (2.3			2.3	
END TIME H: M	55:11		*	£6:6/			70:34		H:14				21:49			27:43	
START TIME H : M	12:09			10:41			P/:02	,	0.42				31.17			95.16	
LOOK DIREC- TION	2			 	·-··		Ċ						., 				
ANGLE OF INC. (deg)	257		,	59			55,		3	25			55			55.6	3,
104	HH	77		HF	10	7,0	H.F.	27	37	H H	2,0	36.	ΉН	10	25	нн	AC MAY IC
FREQ GHz	45.27	``	0.51.04	`	X.	£25.3	5.3	`	ó	`	:	15	``	` `	4.5-7.7	•	9.0-18.0
TAPE NO	138	1	*	`	*	` `	•	\	11/11	· ·	`	`		` `	•		; ;
RUN NO.	770914	315027	12001	271003	4001ET	101147	171103	771104	271105	271106	101147	171169	321110	illiet	211112	221113	27111

DATE: Jan 27, 1984

IC: Internal calibration C: Cross wind, D: Down wind, U: Up wind

					•						
WIND DIRECT-	10N (2cg)										
MINO	(Knots	11						-			
	uahr	7.17					-				
TEMPERATURE C	Air	1		. •							
TIME	 E	13.37					 •		•		
START	I.	23:06	-								
LOOK DIREC-	TION	2								,,	
ANGLE	(deg)	55							 		
Pol		нн	· 21								
FREQ	<u> </u>	1.81-01	\$								
TAPE		148	` `								·
RUN NO. TAPE		321118	61116								•

DATE: Jan 28, 1984

IC: Intérnal calibration C: Cross wind, D: Down wind, U: 11p wind

RUN NO. TAPE	TAPE	FREQ	POL	ANGLE OF INC.	LOOK DIREC-	START	END TIME	TEMPERATURE C		SPEED	WIND DIRECT-		
				(deg)	TION	I .	£ ±	Air	urter	(Knots)	10N (269)		
780001	811	5.3.	PC	•									
280002	2	:	ин	55	2	7:57	04:8	9.7	7:5	3/			
10/2027	×.	ì	IC									,	
201031	*	` `	1111	وک	ر ر	r: S/	4:27	2.4	7.5	4		·	
280103	ì	53,10	IC										
401082	,	0	ММ	55°	2	9:31	4:53	2.3	42	9/			
3801085	usi	:	IC										
250106	``	*	ΗН	\$5	2	10:05	10:30	2.5	4.5	9/			
280107	ì.	: :	Įc				•						
280201	٤	5.3	IC				•.		٠,		12 ₁ +1.		
280202	•	٠.	>	55.	υ	10:35	10:46	2.6.	4.2	%		Aircraft (11)	$\mathcal{C}_{\mathcal{C}}$
280203	*	خ		63		23.10						,	
250204						`	3 !	7.6	7.7	77	•••		_
2802032				•	ر		47:11	7.6	4.4	#		. :	
			#C	75	 J	05:11	11:52	9	4.7	* - 9/		12 g.	

DATE: Jun 28, 1984

IC: Intérnal calibration C: Cross wind, D: Down wind, U: ., wind

			<u>-</u>				<u>.</u>			_ 、		٤				
			Hirch				•	•	3	r	٠	; s				
WIND DIRECT-	ION (deg)										•4 •4				•	
WING SPEED	(Knots		-				5/	Ĩ		Ī	2	6/	(3	(3	ž	ų
	uura						7.5	4.2		7.7	7 5		7 5	7%	4.5	4.5
TEMPERATURE C	Air						7.6	2.6		2.6	ب ن د	3.2	<i>18</i> 6	3.2	4,6	,
END TIME	Σ Σ		∼.				12:25	8\$1:21	•	13:07	13:20	54:61	90:41	14:28	Sh:HI	15:03
START	Σ 		~ .				12:14	(2.30		64.21	3 19	13:31	13:50	£0:h1	14:30	95:11
LOOK DIREC-	TION		J		v		J	J		ა	7	J	U	U	٠٠	٠.
ANGLE OF INC.	(deg)	•	55°		, v.		* %	26°		35°	, 2	55°	,59	650	£.	73°
POL		IC	>	9,	>	21	>	}	IC	}	ż	÷	1:	>	3	25 >
FREQ		5.3	ì	÷		;	à		:	\		:		3	, s	= 3
TAPE		15.4	ì	ž	ù	158	٤	Š	ì	٤		:	: •	; ;	,,	
RUN NO.		280301	28032	280305	280304	280305	280306	280307	2 70308	280309	280310	280311	2803/2	2803134	280315	

DATE: Jan 26, 1984

IC: Intérnal calibration
C: Cross wind, D: Down wind, U: 1.p wind

RUN NO.	TAPE	FREQ	POL	ANGLE	LOOK DI REC-	START	TIME	TEMPERATURE C	ļ	WJAG SPEED	WIND DIRECT-	
,	2			(deg)	TION		ж :	Air	water		ION (Ay)	
104082	16.4	01	15	•								
280402	*	ì	3	73,	v	35:37	bh.51	3.	7 7	3		
280 403	` `	:	IC									
hoh ost	*	۶/	Ic							_		
Sahest	*	١.	^^	ेश्र	v	15:51	16:03	-	4.1	75		
90h02T	è	0,	>	999	v	0/:9/	97:31	~	4.	15		
20002	` `	51	}	610	v	((.))	(2.)	6.	•	ļ		
28040 €	•	ì	77		•))	,	i i	•		
504032		0.	IC.		7				·.			
012092	•	0-	}	570	U	16:38	Bh:91	2.9	4.4	15	. [+4	
11h02T		15	}	57°	v	6:43	16:59	:s= : \	4.5	15		
280412	*	9,	3	5,5	v	11:4)	12:21	2.1	<u>;</u>	9		
2804/3	*	9	સ	•	• • •							
780501	3	5)	Ic				-	•				
705.037	۵		}	، کې	 U	17:27	17:37	5.6	イナ	9,	·.	

DATE: Jan. 24, 1984

IC: Internal calibration C: Cross wind, D: Down wind, U: op wind

RUN NO. TAPE	TAPE	FREQ	POL	ANGLE OF INC.	LOOK DIREC-	START	TIME	TEMPERATURE C		SPEED DIRECT	VIND	
·	}			(deg)	TION	<u> </u>	Σ Σ	2 1/2	1200	thants	10N	i
280503	W9)	1,5	75	•								
40504	` `	91	110									
260 505	٤	•	>	35,	S	44.61	17.32	7 7	7	2/		
280508	٤	5/	}	35°	J	17:53	0.8/	' 5	2 >	9/		
780601	2	0)	î c.									
769037	` `		۸ ^	,52	U	14:44	19:5:	g · t	1 1	4		
280663	ž	51	IC									
409037	١.	15.	3	,22,	J	(4.55	~	7	1 /1	()		
280605	891	0)	ĨC									
280607	ù	ì	3	, 8/	ن ن	\$1.02	77:07	2.5	4 5	1		
260 608	<u> </u>	15,	77									
28069	3	.	}	* 3-	U	30:02	£\$. 07	ى ئ	7.4	•		
					. * * *							
· • .												
	_											

IC: Intérnal calibration C: Cross wind, D: Down wind, U:, p wind

	-		ن - ` ` ا			_ :		÷								
			any . K.			```		`								
TAN KIND	10N (دوريم)												•			٠
1837.	(Knota		00			49	•	79.								
	nutr		0.7			4.0		4.6	•		٠					
TEMPERATURE C	wh a		3	-		ج . ≈		4.4	•							
END TIME	ж ::		61:11			gh:8		15:01			•••		٠,	•		
START			10:30			04:21		13:50		rakon.	Started at 5.40 PM			_	-	
LOOK DIREC-	TION		ŝ			5		5		phic Gloration.	if at			٠;,		. •
ANGLE OF INC.	(deg)	•	55,			° 5,		55°		Sphi	Start			•		
ьог		20	3	ZC	25	}	ZC	}	IC	JC	>	IC	}			
FREQ	,	£ 3.	*	ì	``	ž	*	*	•	0.81-06	ì	4.5-7.7	``			-
TAPE	2	89/	>	` `	\`	ì	HEI	``	`	*	` .	\ \				
RUN NO. TAPE		130001	243052	290003	190101	290102	240103	790104	290105	190201	140701	230205	790206			

DATE: Jan 30, 1984

IC: Internal calibration C: Cross wind, D: Down wind, U: p. wind

RUN NO.	TAPE	FREQ	POL	ANGLE	LOOK DIREC-	START	TIME	TEMPERATURE C		bJAC SPEER	WIND DIRECT-		
	2	<u> </u>		(deg)	TION	I	ж :	Si.z	uura	(Knots	ION (Acz)		
300002	13.0	6.3	IC	•									
300003	•	`	}	55	>	10:54	16:31	بن ع-	4.0	20	,	Boug in the wa	_ <u>.</u>
300004	\.	ì	10				•					0	
300005	17.8	ì	Įc										
300008	*	*	}	, ş	2	35.//	12:36	3.7	3.6	7.4		`	*
300007	`	į	1C							\ 			
300008		9	IC										
300009	``	*	}	55°	2	12:39	13:11	7 7	3 4	77		•	*
300010	*	*	Σ						_				
300011	ï	9/	Ic				• •		٠		•		
300013	ì	75	>	55,	5	13:74	13:48	4.7	3.1	44	*:		,
300013	681	×.	25						-			*	:
300014	,	5.3	IC	•			• • ;			,			
300015	*	,	нн	45	٤,	01:11	07:11	カナ	4.0	67		ì.	:
300 16	*	:	Ic		٠,٠,,						. •		
300017	*	0,	10	٥									
3000 /8	3		MM	45	۔ ح	14:43	61:51	7	5				
300019	•	<u> </u>	20					<u> </u>		777	٠.	· ·	:

DATE: Jan 30, 1984

IC: Internal calibration C: Cross wind, D: bown wind, U: .,p wind

																				
														<u> </u>						
DIRECT.	(CC)											,	•.	:						
NING WIND	thnote	7	5° 1			£ 7		22			70			07			70		22	•
	darı	4 //	, ,			۲.			7				٠.	4.1		•	-		7.7	
TEMPERATURE C	2 1/2 7	7	, ,		•	7.		V.) ·		7.77	S	_	11			9.5		۲.	•
TIME	I I	מי למ				42:91		00:£/		-	17:58	•	•.	19:22			4:54		19:45	
START	I 		17:01			15:56		16:30			11:41			01:61	-		19:23		18:35	,
LOOK DIREC-	NO IL		2			٥			<u> </u>		<u>-</u>			5			2		2	_ ·
ANGLE OF INC. (deg)		• ,	45		o	45		45°		_	45		3	35			35,		35°	
POL		3.5	XX	7:	2	ИИ	ž i.	HH	IC	ય	HH	Ic	JC	1/1/	IC	27	HH	'n	KK	
FREQ		5/	*	*	4.5-27	*		•	;	9.0-18.0	×	*	5.3	*	*	9	*	15	•	
T.APE NO		18.0	`	``	•	*	88/	•	ž	•		•	*	ì	ì	*	2	,	•	
RUN NO. TAPE		300020	300021	300022	300023	30005	300027	300028	30029	301330	30031	30032	300201	3000202	300203	HOTONE	30205	3000008	30207	30,208

AND THE PROPERTY OF THE PROPER

DATE: Jan 30, 1984

IC: Internal calibration C: Cross wind, D: Down wind, U: 1.p wind

			-							_								
JAN WIND	ION (clcy)						-						٠٠,					
b JAn	(Knots		7.7				7.7			23				-				
	ueta		÷				7:5			0.5		• • .					• •	.
TEMPERATURE C	A. z		9.6			•	9.4			9.5		•					i	
TIME	Z 		40.00	-			20:20			20:33		e.	•		••.			
START	_		14:55				60:07			20:22								
LOOK DIREC-	TION		2				2			2						• • • • • • • • • • • • • • • • • • • •		
ANGLE	(deg)	•,	25,				25°			250				-				
Pol		75	NN	7,0		ic	HH	7.5	Ic	**	36							
FREQ	715	5.3	*	*		9	•	•	'n	•	\ \						•	· ·
TAPE		188	•	· ·	19.8		•		•									
RUN NO.	•	300210	30211	300212		HITOE	30215	30216	30217	315008	300219							

DATE: Jan 21, 1984

IC: Intérnal calibration C: Cross wind, D: Down wind, U: .p wind

			"	<i>-</i>	•	`										
יו אבר ו	10N (,7',7')		9.							 , ,						
	(Knots		54			54	·	701								
	מחבו		4.0			4.0		0 1	•					-		
U	A.z		3	-		3.8		2								
TIME	н: м		6/://	•••	-	oh.R		15:01								
TIME	I I		05:01			04:70		13.50		akin	Started at 5:40 PM		-			
DIREC-	TION		s			5		5		! Call	2		•		·•	
OF INC.	(deg)	•	55,			25.		55°		Tresse Calgadin	Start					
		16	3	IC	j	}	Ic	}	IC	77	<u>`</u>	٢.	3			
ZH2		63	*	:	``	:	*	*	` `	4.0-18.0	``	4.5-7.7	;			
2 2		891	×.	*	`	· ·	17.8	ì	•	`	` `	٤				
KON NO.		290:01	290002	290003	740101	290102	290103	790104	290105	102062	290202	290205	270206			

DATE: Jan. 31, 1984

IC: Internal calibration
C: Cross wind, D: Down wind, U: .., wind

										•			
RUN NO. TAPE	TAPE	FREQ	POL	ANGLE OF INC.	LOOK DIREC-	START	TINE	TEMPERATURE C	TURE	17. 17. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1.	WIND DIRECT-		
				(9. p)		Σ Ξ	£ I	A12	44.2.1	(Kaots	10N		
314001	204	53	55	•									
310101	*	*	3	,,	v	34:01	07:11	3.7	3.9	36		A.re- fd 16.34	17.33
310102	•	•	27		l				<u>.</u>			•	•
3/0/03	ì	•	}	2,50		((1				,
310104	*	•	35	ì	ა	1:28	10.31	بر.	3-	30		\$	·
310105		٠	ĨC										
310106	ì	•	3	35°)	(7:0	57:21	3.7	3 9	37			
310107	*		2										
301018	*		3	0 35		256	,						
310109	•	. :	: 2	2	J	45.27	13:06	3.6	39	35		ì	
310110	`	, ,	, }	,55	U	13:03	13:73	.,					
	208								5 7	37			
310111	ì	ì	3	5.5	v	13:15	13:44	ري مو	. 6	37	٠.	٠	
310112	``	•	ic						- >			Arrenalie	1
3101/3	*		}	, ,		77.00	13:56	-	9	322			-
30114	•		ZC)		٠.	-		}			
310115	. \$	•	>	770	ú	13:59	7/:2/	2	9	30			
310116	*	•	10								<u> </u>		
310117	`	*	12	•									
3110118	کر د	į	3	25	·	15:41	14:33	ት ታ	ب م	30	٠.		

DATE: Jan. 31, 1984

IC: Intérnal calibration C: Cross wind, D: Down wind, U: 11p wind

RUN NO.	TAPE	FREQ	Pot	ANGLE OF INC.	LOOK DIREC-	START	END TIME	TEMPERATURE C		P. P. E.D.	WIND DIRECT-		
•				(geb)	TION	x x	Я т	chir.	unn	(Knots	ION (diz)		
310119	208	5.3	₹	. 81	2	16:31	Sh:h/	9.4	8. £	36			
310120	ì	*	7.0					_					
3/0/21	ì	:	IC.	9									
310122	•	×	}	55	A C	74.55	15:46	4.9	39	32		Boug m thi was	χ. Σ
310123	į	ì	7,0					. •					
	19A (Re	nd business	tim 7	mingry pakin of tope#19 Side A)	Side A)								
310124	2/	01 XX	10										
34125	8 2/	0)	3	°55°	2	16:02	16:34	5.1	3.9	24		;	:
310126	*	0		•	•						-		
30127	•	,	}	55	2	16:36	~.	4.9	3.4	5.4			
34/0/8	*	*	DC.	0			••				*:		
310129	•	5:3	IC	الع						,			
310 /31	*	•	<i>H)</i> ;	55	J	14.11	05:21	5.0	کر س	25			
3/0 /32	*	*	ĴĊ				• .						
3/0/33	,	0,	HH	55.	ပ	1834	18:21	2.0	?	25			
3/0/34	861	۶,	ZC	0									
3/0 135	*	٠ کې	нн	5.5	v	18:43	90 6	61.4	ts è	28			
310 201	,	15	Ic	c			,				-		
310202	A .	1	144	13-4.52	ა	19:43	20:25	4.6	× Ø	3.	٠.		

DATE: Jan 31, 1984

IC: Intérnal calibration C: Cross wind, D: Down wind, U: i.p wind

RUN NO.	TAPE	FREQ	POL	ANGLE OF INC.	LOOK DIREC-	START TIME	END TIME	TEMPERATURE C		WIND WIND	WIND DIRECT-	
				(gep)	TION		π 	ch.r	uatr	(Anots	((C(4))	
310203	961	51	10	•								
402018	•		7,0	0								
3/0205		`	##	45	C	14.02	21:15	6.6	3.8	31		
302018	ì.	•	JC					•				
30207	•	0)	25	•					,			
310208	*	ž.	ин	2	u	11:17	14.17	5	ري م	30		
31209	*	*	20								-	
310240		اح	25	0				3				
3/02 //	*	ì	1117	4	C	9/1.18	21:52	2	عه ن ک	30		
	310											
310212	ì	ري	27	•			•					
310213	•		HH	, \$	v	21.55	22.76	بر خ	37	30		-
310,214	· ·	:	IC				•,					
				-			٠.		-			
									•			
		-		<u></u>	٠.,							·· <u>·</u>
			_	-								
				· , · · ·	•						٠.	

IC: Internal calibration C: Cross wind, D: Down wind, U: 1.p. wind

TAPE	TAPE	FREG	POL	ANGLE	1.00K	START		TEMPERATURE		17.74	QNIA		
	0	Z HZ		OF INC.	DIREC- TION	TIME H M	TIME H : N	2.7	1200	(Knats	(Knots Cery)		
200010	21.0	5.3	IC	•	•							Acr. 4- ft \$1.361	F1. 341
5/683	į	ì	IC									in the second	ŗ
400010	*	•	3	°%,	<u>ح</u>	16:37	11:05	3 6	ب رد	۴			
500010	•	*	IC						,	, : 			
900010	`	٤	3	24°		01:11	11:36	ار	ج <u>ن</u> ج	,			
500315	ï	,	ĨC		*					l 1		Awaret	Ī
800010	:	ì	70	,								(bor) her in the	なられて
\$0 0010	ì	ž	3	55	2	11:59	12:53	7.4	35	4			
010010	8/10	``	3	2>°	2	12:55	15:23	0.7	3.5	20			
011011	22.8	*	JY #	°#	3	1235	(53)						•
210010	*	01	15										
h/eJ/0	•		3	, \$\$	2	15:28	15:57	1.1	ا ن د	91			
5/00/0	ì	``	10										
9,00,0	*	15	2,5										
610010	3	•	3	55,	2	16:03.	97:91	F.	و ۲۰:	2			
810010	*	5.3	77	ŗ		-							
610010	*	*	>	, , ,		16:29	80 21	7.0	3.6	70			
0,0070		•	27										
010021	,			n				_	,	,			
278010		>	114	55	Э	81:61	77.1	~	٠ ج م	1			

DATE: Feb 1, 1984

IC: Internal calibration
.c: Cross wind, D: Down wind, U: 11p wind

KUN NO.	TAPE	FREQ	POL	ANGLE OF INC.	LOOK DIREC-	START TIME	END TIME	TEMPERATURE C		14.1AC	JAN WIND	
				(deg)	TION	E E	E #	Ar	aure	thnots	(C(2)	
010013	728	5.3	1111	55.	2	n2.41	14:21	7.7	3.6	77		
P & 00/0	`	ž.	77									
520010	:	0	10		= 							
970010	ì.	*	HH	55	2	54:41	۰	2:3	3.7	23		
	228) -			•	
820010	` `	*	75									_
620010	<u>.</u>	ζ,	77		-							
0/10/30	` `	ì	H);	25,	2	50:81	14.81	9.1	3.7	23		
010031	:	``	IC			•						
0/1032	3	5.3	77									
011033	:	;	}	24°	v	11:61	#:h:b	6.	3.7	74	. •	
010034		:	IC								;	
0/@35	ì	0	10									
010036	ŧ	:	3	24.	V	64.61	70:21	1.3	ب 4	27		
01037	•	:	10	-	,,,				1			
310036	ì	/5	2 C									
V @ 39	٠	ì	3	5.64	J	20:23	34.05	o e	ن م	29		
0/100/0	<i>ند</i> .	`	75								٠,	

DATE: Feb 1, 1984

IC: Internal calibration
C: Cross wind, D: Down wind, U: p wind

RUN NO. TAPE FREG POL A	POL	_	40	ANGLE OF INC.	LOOK DIREC-	START TIME	END TIME	TEMPERATURE C		13.00 3.75.20	JAN KIND	
(deg)	(deg)	_	_	_	2	H : H	Σ Ξ	J. 2	aure	tknots	((c(,))	
231 53 10	70		1									
" " H# 54° C	HH 54°	540		\dot{c}		90:17	37:17	4.0	ن ب	o 7		
		10					-					
" 10 10		10	•				,	•				
,, ,, HH 54 C	HH SH	24		J		21.76	22:10	9.0	- بئ آن	31		
" i. ic		10										
15 50	7,	··										
2 15 HH	1.5 1111	3 / 5	- <u>-</u>	C		22:22	2.5.7	1.1	3.5	31		
, 10		10										
							•,					
											:	
						-	٠.		•			
									-	_		-
·	· · ·	·		·				_				•
		-	-	-					-			
A.		-										

DATE: FUB 2, 1984

IC: Intérnal calibration C: Cross wind, D: Down wind, U: .p wind

RUN NO. TAPE	TAPE	FREQ	70d	ANGLE OF INC.	LOOK DIREC-	START TIME	TIME	TEMPERATURE C		43.Xr. 58.85	JAN WIND	
				(deg)	TION	x	£ 	r / r	יוני בינ	(Knots	((()))	
02001	23.8	5.3	ic									
70000	:	; 	1/4	,2	Ċ	7:35	3 0	مد	~ ~	76		
02003	`	ì	27									
02.004	238	٤	IC									
50000	` `	٤	3	45.	v	4:22	84:8	, 4	3.1	25.		
9 000 6	:	5.3, 10	10								· · · · · · · · · · · · · · · · · · ·	
ten 70	:	ś	}	45,	7	1.5.8	27:6	23	3.1	74		
3000 60	;	51 01	íc									
300000		5,	>	, \$	J	. 42 6	25.6	\n \	5.5	57		
07000	ì	15.	77									
110000	ì	5.3	J.C	1			•,			•	,	
210010	÷	×.	}	5.5	v	2:01	05:01	2	3.6	>o ~		
	248											
67 00 60	ŧ	5.3	ĬĊ				٠,					
hlasto	;	01	77				,					
510000		0/	>	55	·	54:01	8.71	6.4	36	31		
02 00 16	` ` `		ic									
	: <u>-</u>					-						

DATE: 1.5.2.1984

IC: Internal calibration C: Cross wind, D: Down wind, U: , p wind

RUN NO.	TAPE	FREQ	Tod	ANGLE OF INC.	i	START	END TIME	TEMPERATURE C		WING WIND	NIND DIRECT-	
				(deg)		Σ Ξ	Σ Σ	vi r	in r	(Knots	10N (A)	
F140 20	240	5.3	27	•						9 ,		15. eg in 15.
8100	*	ž.	>	5.5	2	11:35	45:51	46	ئ. ق	•		
6100 20	:	ì	IC									
07000	:	9	25									
12000		•	>	55°	2	12:54	13:15	w Uğ	35	3.6		
02023	348	ì	25									<u> </u>
420020	:	75	N.									
570070	•	ì	3	² 5 5	כ	13:24	13:54	ع. هر	3.5	7.4		-
92000	×	ì	25									•
42m20	د د	5.3	IC.				• ,	-	• •.		. •	
320020	;	``	3	53	D.	14:32	15.23	,	3.5	9/	٠,	
621 20		:	57			-				7	-	
02,20	`	5.3	IC	,		;				-		
02031	3	٤.	HH	55	'ز	15:32	15:39	9.5	35,	2/		
02032		01	37		••.							
02033	į.	ن و	HH	5.5	- ت	\$5:38	hh:51	; ;	ιų Įū	9/		
	•	e e) 7									

DATE: Feb 3, 1984

IC: Internal calibration C: Internal calibration C: Cross wind, D: Down wind, U: up wind

		-										, _ , _ , _ , _ , _ , _ , _ , _ , _ , _		-
	ION (dir.y.)											٠.		
11.11.11.11.11.11.11.11.11.11.11.11.11.	(Knots		9/		9/		*			4			¥	
	auto		3.5		3.5		3.5			3.5			3.5	
TEMPERATURE C	Air		7 7		2. 2.		97			9 7			45	
END TIME	£ E		4:04		01:23		01:0			18:20		••	07:50	
START			a: 55		80:10		21:29			70.7			04:20	
LOOK	TION		3		ر د		ر د			၁			つ	
ANGLE	(deg)	•	45		åSh		, s,		•	, 5		n	54	
POL		ĨC	ин	Ic	HH	ĨC	>	SC	27	3	25	JC	}	,
FREQ	2 2 2	01	0,	18	:	è	ì	ì	5	٥	•	5.3	5.3	;
TAPE	2	842	*	:	ì	ì	ï	;	:	· ·	4	è		`
RUN NO. TAPE		30215	972080	0302/7	330216	030219	030220	030221	230222	630223	030224	221080	030 226	20.223

IC: Intérnal calibration C: Cross wind, D: Down wind, U: 11p wind

RUN NO. TAPE	TAPE	FREQ	POL	ANGLE OF INC.	LOOK DIREC-	START TIME	END	TEMPERATURE C		b JAC	WIND DIRECT-		
				(deg)	TION		я я	Air	dutr	(Knots	ron (2,2)		
101000	248	5.3	25	•									
201020	ì	:	3	, ss	2	87.91	95:91	* 7	s, S	61			
020103	.	` `	Ic										
Poloto	:	:	ن 1-1					•				9	1
0201050	25A	0.81-06	20					. •			-	- fue	\$ }
901000	:	:	}	55.	כ	15:01	10:81	£.	3 6	<u>.</u>			
601000	`	:	Ĵζ		-								
102020	`	L.E. S.A	IC				-						
402020	:	`` 	}	55,	ъ Э	18:38	44.61	4.4	ა ^	7			
020205	258	1	26	,			· - - ·						
902020	È	5.3	3	55	٦	45.61	22:05	3.5	7 €	9/			
400000	÷	:	IC				•)		·		
802020	26A	o,	sc								•		
602020	:	à	3	28,	>	22:05	23.28	5 %	3.5	9			
012020	ì	10,15	70			_			•		_		
11000	:	7	3	\$5	Ċ.	08:82	07:00	2.0	35	<u>م</u>			
230212	268	15/	IC				(5 93)						
302/3	*	6 .3	IC	3	-					,			
44080	*	,	////	3	S	45:52	45:00	1.1	3.5	y	. ,		

DATE: 66 3, 1984

IC: Intérnal calibration C: Cross vind, D: Down wind, U: ..p wind

FREQ		POL	ANGLE OF INC.	LOOK DIREC-	START	END TIME	TEMPERATURE C		18181	110		
			(deg)		Σ Σ	# #	c4. z	autr	linats	((24)		
5.3 I	1	ΣC	•								Aricant Flig.	F165.4
:		>	° %	2	14:41	66:01	2	4.4	24			
``		77										
3		>	, v.		35:55	7/."	2	i,	76			
:		Ic	,)		:	••	•				
*		>	35,	5	11:17	54.11	4.1	3.4	12 55			
,		IC										
: _		>	3.5	כ	\$4:31	.(2:03	7	3.4	24		-	
· ·	' -	J.C										•
		>	, 55	つ	90:21	3:12	د. بر	34	30	٠.		
:	۲,	10))					
						•						
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